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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/759,592	01/16/2004	Jie Liu	062987-0107	8701

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EXAMINER	
MILLER, DANIEL H	
ART UNIT	PAPER NUMBER
1794	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/759,592	LIU ET AL.	
	Examiner	Art Unit	
	DANIEL MILLER	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *8/1/2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *69-71,73,74,77-80,82 and 89-96* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *69-71,73-74, 77-80,82 and 89-96* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/1/2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 93-94 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3. It is not clear what “relatively straight" is. Applicant has not defined what the nanotubes are "relatively" straight in relationship to. The term “relatively” is relative and does not lend it self to a being readily definable or quantified therefore the meets and bounds of the claim can not be determined and the claims are considered indefinite. Correction required.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 69-71, 73-75, 77-80, 82, 89-96 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smalley et al. (US 6,749,827) in view of Kim (*Synthesis of ultralong and high percentage of semi-conducting single walled carbon nanotubes*; Nano Letters 2002 Vol. 2 No. 7 703-708).

3. Li (US 7,157,068) is cited for evidentiary purposes.

4. Smalley et al. teaches a process for the growth of single-walled carbon nanotubes and macroscopic fibers comprising single-walled carbon nanotube arrays to any desired length (col.12, lines 8-22 and col. 23, lines 17-29). The lengths may range from nanometers up to meters (col. 28, lines 37-51). The fibers are grown or elongated using single-walled nanotube arrays as templates, whereby the diameter of the fiber may be controlled as well.

5. The reference demonstrates a desired push in the art to grow longer continuous carbon nanotubes that are needed for particular applications.

6. It would have been obvious to one of ordinary skill at the time of invention to grow the nanotube fibers, or strands, of Smalley to a length within the claimed ranges in order to suit a desired use, such as field effect transistors or biological sensor applications which require longer length nanotubes. One of ordinary skill would recognize that increase in processing time would (due to growth rates of the nanotubes) yield longer nanotubes. No patentable distinction is seen.

7. Further, the claimed invention does not define over the prior art. It is well known in the art that nanotubes can grow out of the open ends of other nanotubes or out of

side wall defects (sometimes referred to as Y branching; see Li US 7,157,068). This growth phenomenon would inherently provide an "individual" nanotube as claimed with longer branched nanotubes being formed. In the case of Smalley one of ordinary skill would expect that with increased growth time would inherently produce longer nanotubes as claimed. No patentable distinction over the prior art and the claimed invention is seen.

8. Due to the diameters of single-walled nanotubes (about 1-2 nm) the aspect ratio of the nanotube strands of Smalley et al. are seen to be greater than 10^8. The resistivity, electrical behavior, and Young's modulus of the strands and nanotubes are not specifically taught, however they are expected to be within the claimed ranges as no difference is seen between the product of Smalley et al. and that of the instantly claimed invention.

9. Where, as here, the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted to the applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product. See In re Best, 195 USPQ 430.

10. Where, as here, the reference discloses all the limitations of a claim except a property or function, and the examiner cannot determine whether or not the reference inherently possesses properties which anticipate or render obvious the claimed invention, the burden of proof is shifted to the applicant, as in In re Fitzgerald, 619 F.2d 67, 205 USPQ 594 (CCPA 1980). It is noted that the process steps claimed in a product

by process claim are considered only insofar as they affect the structure of the claimed product.

11. Smalley does not teach an array or group of isolated nanotubes.

12. Kim teaches SWNTs grown from patterned Fe2O3 nanoparticles wherein isolated nanotubes (or groups of nanotubes) are grown with lengths > 100 micrometers and observed lengths as long as 600 micrometers.

13. The claim language "a carbon nanotube synthesized on a substrate" of claim 69 does not positively recite a substrate and is considered a product by process limitation.

14. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.", (In re Thorpe, 227 USPQ 964,966). Once the Examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious different between the claimed product and the prior art product (In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983), MPEP 2113).

15. Regarding claim 79, Kim teaches the nanotubes can be exploited to for building large numbers of FETs (Field Effect Transistors) or sensors along their lengths (pg. 707).

16. Regarding claim 73, it is not clear that the process steps claim define the invention structurally. Therefore, the claim is anticipated.

17. Regarding claim 72, the nanotubes are smooth and continuous.

18. Regarding claim 75, the SWNT's are substantially isolated from one another.

19. Regarding claim 77, the SWCNT's inherently containing metal Fe catalyst impurities present from fabrication; which could function as an electrode. In the alternative, Kim teaches the nanotubes can be exploited to for building large numbers of FETs (Field Effect Transistors) or sensors along their lengths (pg. 707).

20. Regarding claims 78-83, it is noted that the term device is not defined in the specification. Therefore, for purposes of examination any article is considered to meet the limitation "device". Kim teaches the nanotubes can be exploited to for building large numbers of FETs or sensors along their lengths (pg. 707). Since the nanotubes are capable of being used for their physical or electrical properties and therefore meet the limitation of a "device".

21. The reference demonstrates a desired push in the art to grow longer continuous carbon nanotubes that are needed for particular applications.

22. It would have been obvious to one of ordinary skill at the time of invention to grow the nanotubes of Smalley in view of Kim that are substantially isolated as in Kim to a length and diameter within the claimed ranges in order to suit a desired use, such as field effect transistors or biological sensor applications which require longer length nanotubes in isolated arrays. One of ordinary skill would recognize that increase in

processing time would (due to growth rates of the nanotubes) yield longer nanotubes. No patentable distinction is seen.

23. Claims 73 and 76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smalley in view of Kim and further in view of Lieber et al (US 6,781,166 B2).

24. Smalley in view of Kim, discussed above, are silent as to the nanotubes being in a crossed networked array.

25. Lieber teaches an electrical device having a cross networked array of nanotubes grown from catalytic particles on a substrate (figure 1 and abstract).

26. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Smalley I view of Kim by growing the nanotubes from a catalytic particle on a substrate and achieving a cross networked geometry as in Lieber in order to take advantage of the electrical properties of the nanotubes in Smalley in view of Kim; using them in an electrical switch (i.e. memory device; see figure 5 Lieber) substantially similar to Lieber.

Response to Arguments

27. Applicant's arguments with respect to all pending claims have been considered but are moot in view of the new ground(s) of rejection.

28. The previous 112 1st paragraph rejection has been withdrawn. However, a new 112 2nd paragraph rejection has been asserted against new claims 93 and 94 (see above).

29. New rejections have also been asserted over Smalley in view of Kim due to applicant's amendment and change in the scope of the independent and dependent claims and dependencies of the dependent claims (see above).

Conclusion

30. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL MILLER whose telephone number is (571)272-1534. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Keith Hendricks can be reached on (571)272-1401. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Daniel Miller

/KEITH D. HENDRICKS/

Supervisory Patent Examiner, Art Unit 1794